



Atmospheric electric field in the Atlantic marine boundary layer: first results from the SAIL project

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The study of the electrical properties of the atmospheric marine boundary layer is important as the effect of natural radioactivity in driving near surface ionisation is significantly reduced over the ocean, and the concentration of aerosols is also typically lower than over continental areas, allowing a clearer examination of space-atmosphere interactions. Furthermore, cloud cover over the ocean is dominated by low-level clouds and most of the atmospheric charge lies near the earth surface, at low altitude cloud tops.

The relevance of electric field observations in the marine boundary layer is enhanced by the fact that the electrical conductivity of the ocean air is clearly linked to global atmospheric pollution and aerosol content. The increase in aerosol pollution since the original observations made in the early 20th century by the survey ship *Carnegie* is a pressing and timely motivation for modern measurements of the atmospheric electric field in the marine boundary layer. Project SAIL (Space-Atmosphere-Ocean Interactions in the marine boundary Layer) addresses this challenge by means of an unique monitoring campaign on board the ship-rigged sailing ship *NRP Sagres* during its 2020 circumnavigation expedition.

The Portuguese Navy ship *NRP Sagres* departed from Lisbon on January 5th in a journey around the globe that will take 371 days. Two identical field mill sensors (CS110, Campbell Scientific) are installed on the mizzen mast, one at a height of 22 m, and the other at a height of 5 meters. A visibility sensor (SWS050, Biral) was also set-up on the same mast in order to have measurements of the extinction coefficient of the atmosphere and assess fair-weather conditions. Further observations include gamma radiation measured with a NaI(Tl) scintillator from 475 keV to 3 MeV, cosmic radiation up to 17 MeV, and atmospheric ionisation from a cluster ion counter (Airel). The 1 Hz measurements of the atmospheric electric field and from all the other sensors are linked to the same rigorous temporal reference frame and precise positioning through kinematic GNSS observations.

Here the first results of the SAIL project will be presented, focusing on fair-weather electric field over the Atlantic. The observations obtained in the first three sections of the circumnavigation journey, including Lisbon (Portugal) - Tenerife (Spain), from 5 to 10 January, Tenerife - Praia (Cape Verde) from 13 to 19 January, and across the Atlantic from Cape Verde to Rio de Janeiro (Brasil), from January 22nd to February 14th, will be presented and discussed.